Code No: 184

SYLLABUS FOR MARINE BIOLOGY

P.G. Standard

PART-I

1. TAXONOMY

Classification of elasmobranches & marine teleosts, crustaceans, molluscs – important fishes of the World; Morphometry, mereistics, morphology of commercially important fin and shell fishes along with their diagnostic characters; sea turtles & mammals – classification – diagnostic characters.

2. BIOLOGY OF MARINE ORGANISMS

Food and feeding habits of commercially important marine shell fishes and fin fishes- methods; age and growth; length-weight relationship, reproductive biology – maturity stages, gonadosomatic index – spawning periodicity, fecundity of commercially important marine fin and shell fishes-methods; eggs & larvae and developmental biology.

3. MARINE CAPTURE FISHERY RESOURCES

Classification, definitions of fishery zones and fishery resources – neretic, benthic, demersal, pelagic & deep sea systems; fishery resources of the World; major exploited marine fishery resources of India – offshore and deep sea fisheries; marine fish production – World, India & Tamil Nadu; potential marine fishery resources of Indian Exclusive Economic Zone.

4.PHYSIOLOGY

Water as a biological medium; respiration, circulation, digestion; excretion, osmoregulation & reproductive biology of marine organisms; effect of environmental factors on physiology of fin fishes and shell fishes;

standard and active metabolism; important endocrineglands; general principals of immunology of marine organisms.

5. STOCK ASSESSMENT OF MARINE ORGANISMS

Definition of population dynamics; von Bertalanffy's growth model, total instantaneous mortality; fishing mortality and natural mortality - estimation; catch per unit effort, catchability coefficient, Maximum Sustainable Yield (MSY) – merits and demerits; Maximum Economic Yield (MEY), Fishery Maximum Economic Yield (FMEY); Population models; open access fishery; overfishing – growth overfishing; recruitment overfishing.

6. METEOROLOGY AND GEOGRAPHY

Structure of atmosphere; weather & climate – definition and concepts, characteristics and laws of back body radiation; solar radiations, its characteristics; vertical and horizontal heat balances; air temperature – horizontal distribution; explanation of DALR, SALR and isotherms; general circulation – monsoon characteristics, water in atmosphere – condensation; clouds and its classification; weather systems – FAO classification of fishery zones of world oceans.

7. PHYSICAL OCEONOGRAPHY

Physical properties of sea water, temperature, seasonal thermocline, temporal variation of Sea Surface Temperature (SST); Density vertical and latitudinal variation; light penetration; colour of the sea; concept of Sonar, channel and shadow zone; heat budget; T.S. diagram; concept of water mass – water mass in Bay of Bengal and Arabian Sea; introduction to marine geology – continental shelf, slope; topographic features of Indian ocean.

8. CHEMICAL OCEONOGRAPHY

Evolution of ocean, chemical properties of sea water; major and minor constituents in sea water; salinity, constancy of composition, alkalinity of sea water; buffer systems; nutrients in the ocean; phosphorus and silicon cycles; carbon cycles; nitrogen cycles; upwelling, manganese nodules.

9. MARINE POLLUTION

Classification of Pollution – physical, chemical and biological classification; sewage and domestic waste; sewage treatment and its use; organic and agricultural wastes in inshore waters; heavy metals, radio activity, radio nuclide pollution; oil pollution, biological indicators of marine pollution, production of fish food organisms from wastes – pollution Control Board and prevention of pollution.

10. MARINE ENVIRONMENT & BIODIVERSITY

Marine environment, flora and fauna; components of marine ecosystems – marine communities – benthic, pelagic, zonation in rocky, sandy & muddy shores; coral reef ecosystems; prey-predator relationship; animal association – symbiosis, mutualism and parasitism; marine biodiversity – species and genetic diversity, habitat diversity, mangroves and oxbow lakes, marine biodiversity act; captive & breeding management of endangered species.

PART – II

1. BIOLOGICAL OCEANOGRAPHY

Divisions of marine environments – pelagic, euphotic, aphotic divisions and their sub divisions; population of the oceans; general account of major groups of phytoplankton, zooplankton and their relationships; geographical and seasonal variation in plankton production and fishery; life history of benthic, rocky, muddy, reef, boring and fouling organisms; major environmental factors affecting the life in the ocean; marine food chain and food webs.

2. CULTURE OF COMMERCIALLY IMPORTANT MARINE SHELL FISHES AND FIN FISHES

Sea Farming in different parts of the World; resources of marine species for shore based aquaculture; sea farming in India; scope of mariculture in Tamil Nadu; important candidate species of marine fin fish and shell fish viz. Sea bass, grouper, snapper, cobia, pompino, milk fish, shrimps, lobsters, crabs, mussels, clams, oysters, seaweeds, etc.; shore based aquaculture systems – intensive, semi intensive, race ways, cage, pen, etc.; culture methods and breeding techniques – *Penaeus indicus*, *P.monodon, L.vanneamei;* quarantine facilities.

3. MARINE ORNAMENTAL FISHES

Classification – marine ornamental fishes – cultivable traits of important marine ornamental fin fishes and shell fishes (clown fishes, pomocanthids, pomocentrids, labrids, seahorses, pipe fishes – scatophogus & marine shrimps and ornamental molluscs); Marine aquarium – export potential of marine ornamental fishes; live feed culture.

4. CONSERVATION AND STOCK ENHANCEMENT

Conservation needs of fauna and flora; conservation of habitats, exploited, endangered, rare, extinct marine fishery resources; protected areas, marine parks sanctuaries, mangroves, coral reefs, sea grass beds, nesting beaches of turtles, artificial reefs; fleet regulation, ghost fishing; ban on gears; total allowable catch, closed areas and closed seasons, illegal unregulated, unreported fishing (IUU); conservation programmes for endangered species; biosphere reserve – Gulf of Mannar (GOMBROT); sea ranching; Indian Ocean Tuna Commission, International Whaling Commission, Marine Fisheries Regulation Acts in India and Tamil Nadu. Laws of the Sea; Code of conduct for responsible fisheries.

5. NAVIGATION AND SEAMANSHIP

Types of navigation – coastal navigation, distance and direction in navigation – Rules of the Road for fishing vessels – Navigational types and importance – Magnetic compass, Gyro compass, Sextant, bearing instruments; chart abbreviations and symbols; types of charts and chart reading; sounding instruments – echo sounder, lead lines; electronic navigation & communication; radio transmitters and receivers; VHF, SONAR, block diagram, Radio Telephones, RADAR and GPS; bad weather conditions and warning signals.

6. MARINE HATCHERY MANAGEMENT

Natural seed resources – site selection & collection methods; life cycles of commercially important cultivable marine fin fishes and shell fishes of Tamil Nadu; brood stock management; breeding and hatchery management of commercially important of marine fin and shell fishes of

Tamil Nadu; food and feeding habits of larval stages of important shell fishes; water quality management; seed transportation – use of anaesthetics, synthetic hormones used for induced breeding; cryo preservation techniques.

7. ADVANCEMENT IN MARINE FARMING TECHNOLOGIES

Open sea cage farming, race way culture, raft culture; feed formulation and manufacture, feed types – wet feed, moist feed, dry feed, pellet feed, mashes, floating pellets; use of preservatives and anti oxidants; FCR, FER, PER; nutritional deficiency diseases, good management practices in marine farming.

8. COASTAL ZONE MANAGEMENT

Goals and purposes of coastal zone management; management methods and information, public awareness and environmental policies; general coastal zone programme, shore lands management; coastal water basin protection; coastal water quality protection; harvestable resources and ecosystem restoration, Coastal Regulation Zone Act; Integrated Coastal Zone Management; International treaties and conventions; preparation of projects based on the provided guidelines and standards for coastal project in aquaculture; estuarine flood protection, sewage treatment systems, power plants and solid waste disposals, etc.,

9. DISASTER MANAGEMENT & REMOTE SENSING APPLICATIONS

Global warming – types of natural and man made hazards in fisheries and aquaculture and cyclones, floods, droughts, tsunami, El Nino, algal blooms, avalanches, pollution destructions; Introduction of exotic species; epidemics, land slides and laws of biodiversity; management strategies –

pre disaster, during disaster and post disaster – prevention, preparedness and mitigation; post disaster - different ways of detecting and predicting of disasters, methods for assessment of initial and long term damages, reconstruction and rehabitation; prevalent national and global management practices in disaster management; agencies involved in monitoring and early warning – district, state, national and global level; assessment of initial and long term damages; uses of communication channels and media; disaster case studies.

10. REMOTE SENSING, MARKETING AND COOPERATION

Remote sensing satellites – application of INCOIS data in capture fisheries; introduction of marketing – market structure and functions – fish markets – demand and supply of fish - price fixation in marine fish markets, hygienic handling of fishes, cold chain marketing – resources availability for marketing; principles and objectives of cooperation; cooperative movement in India, problem of fisheries cooperative management in relation to resources, production and marketing; role of fishermen Cooperative societies in the upliftment of marine fishers.